ABSTRACT

This invention provides heat transfer systems and methods of cooling surfaces and heating liquids which employ surfaces including a minimum density of discrete, nucleation sites having a conical cross-section tapering to a minimum predetermined depth. These surfaces are placed in contact with a refrigerant having a preselected boiling point so that the nucleation sites become largely flooded with the refrigerant. The nucleation sites permit nucleate boiling of a refrigerant without a temperature overshoot on the initial ascent. In more preferred variations of this invention, specific site spacing and geometries are employed to contain tiny bubble embryos, which minimize hysteresis and reversal of trend effects.

LIST OF REFERENCE NUMERALS

10 Chip
11 Module
12 Gold Film Contacts
14 Back Surface Thermocouple Locations
16 Insulated Copper Power Leads
17 Voltage Taps
18 T-Type Thermocouples
20 Felt Insert
22 Short Stainless Steel Tube
23 Cryogenic Adhesive
24 Fiberglass Insulation
26 Felt Insert
28 Cryogenic Adhesive
30 Specimen
32 RTV Silicon Adhesive/Sealant
33 Power Leads
34 Stainless Steel Sting
36 Pass-Throughs
37 Thermocouple Wires
39 Voltage Taps
42 Insulated Stainless Steel Tank
44 Vertical Immersion Heater
45 Bottom Plate
46 Thermocouples